Abstract

Five designs of dielectric barrier discharge (DBD) atomizers have been constructed and optimized employing arsane as a model analyte. The individual DBD designs differed from each other in the style of electrode attachment, electrode shape and area. An externally heated quartz tube atomizer and another DBD atomizer design that have been studied before were used as reference. All the atomizer designs studied including the reference atomizers were found compatible with detection by atomic absorption spectrometry (AAS) giving comparable sensitivity of 0.44 s ng^{-1} As and detection limit around 0.2 ng ml^{-1} As under optimum atomization conditions. However, significant differences in optimum operation conditions were found among the DBD designs in terms of the applied voltage depending strongly on the style of electrode attachment. The design with metal strip electrodes glued to a quartz body requires more than 14 kV to be operated. The design with sputtered electrodes of the same shape can reach the same sensitivity with 8.5 kV. Selected DBD designs have been proven to be compatible also with other spectrometric detectors such as atomic fluorescence spectrometry (AFS) reaching detection limit 0.05 ng ml^{-1} As or atomic emission spectrometry (AES) with detection limit of 30 ng ml^{-1} As showing the universality of the planar DBD designs.

Keywords

Atomic spectrometry, dielectric barrier discharge atomizer, arsenic, hydride generation